

**FINAL REPORT**

**SURVEYS AND INVESTIGATIONS PROJECTS**

As Required By

**FEDERAL AID IN WILDLIFE RESTORATION ACT**

**MISSOURI**

**FEDERAL AID PROJECT NO. W-13-R-41 (1987)**

**STUDY NO. 3: Evaluation of Management Practices and Farming Systems  
on Missouri Wetland Wildlife Areas**

Job No. 1: A survey of agricultural cropping systems and wetland  
management practices on selected Missouri Department of  
Conservation wildlife areas

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FINAL REPORT  
SURVEYS AND INVESTIGATIONS PROJECTS

STATE OF MISSOURI

Project No. W-13-R-41 (1987)

Study No. 3

Job No. 1

Reporting Period: July 1, 1986 through June 30, 1987

Project Period: 1986-1987

Study No. 3: Evaluation of Management Practices and Farming Systems on Missouri Wetland Wildlife Areas

Job No. 1: A survey of agricultural cropping systems and wetland management practices on selected Missouri Department of Conservation wildlife areas

ABSTRACT

Farming is an important component of waterfowl management on wetland areas. Agricultural crops are important to waterfowl and farming maintains an early successional plant stage that is important to some wildlife species. Unfortunately, information about specific agricultural operations and management on individual areas is not readily available.

Information in this report summarizes current farming practices and management programs on major wetland wildlife areas in Missouri. The information will serve as a basis for future research that will focus on specific relationships between agricultural practices and wildlife.

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Study No. 3: Evaluation of Management Practices and Farming Systems on Missouri Wetland Wildlife Areas

Job No. 1: A survey of agricultural cropping systems and wetland management practices on selected Missouri Department of Conservation wildlife areas

Objectives:

1. To describe current wildlife management goals and objectives, agricultural practices and water management on MDC wetland wildlife areas with at least 100 acres (40 ha) of land that is subject to natural or artificial flooding or 1,000 total acres (400 ha).
2. To identify needed areas of research as perceived by wildlife area managers.

Introduction:

Agricultural crops have long been recognized as important foods for certain species of migratory waterfowl (Martin and Uhler 1939, Bellrose 1944, Korschgen 1955, Anderson 1959). Most agricultural production occurs on private waterfowl management areas (Arthur 1968, Vaught and Kirsch 1966).

Row crops are a source of high energy food for migrating and wintering waterfowl and the amount of seeds produced per unit of area is usually higher than with most natural foods (Fredrickson and Taylor 1982). Agricultural crops can also be produced, and are available to waterfowl, on upland or



unleveed bottomland sites that are not flooded. Natural foods are normally unavailable unless flooded.

In addition to food production, periodic farming can be used in moist soil management units to maintain a desirable vegetation composition. Soil disturbance from activities such as farming or disking maintains an early successional plant stage and seed production from annuals remains high. Control of undesirable plants, particularly woody species, is often accomplished through periodic farming.

In the past, farming programs on many wetland wildlife areas in Missouri were based on conventional agriculture. Continuous rowcropping relied upon inorganic fertilizers and herbicides for soil fertility and weed control. Results were reported and judged primarily on the number of acres planted and yield (Vaught and Kirsch 1966, Babcock et al. 1978, Humburg et al. 1985).

In recent years, an awareness of the importance of factors other than crop yield has surfaced. Soil erosion has become a renewed concern and has been identified as the primary conservation problem on approximately 50% of the agricultural land in the United States (Metcalf and Elkins 1980). Soil erosion reduces the natural fertility of agricultural lands and results in silt deposition in floodplain wetlands. The routine reliance upon inorganic fertilizers and chemicals to increase seed production and control weeds and insects has also been questioned. The potential environmental risks associated with agricultural chemical use are summarized by Giere (1980) but definitive information is lacking.

Regardless of the above concerns, questions remain as to which farming system or cultural practices (crop types, rotations, tillage, etc.) are best suited for individual wildlife management programs. Except for acreage and crop information needed for auditing purposes, information about agricultural

operations on individual areas is not readily available. The purpose of this survey is to summarize current management activities, particularly farming and water management systems, on Missouri wetland wildlife management areas. The information in this report will be used as a basis to guide future research relating to wetland management programs in Missouri.

#### Methods:

A preliminary determination of areas to be surveyed was made by reviewing existing descriptions of Missouri Department of Conservation wildlife areas. Wildlife District Supervisors were then contacted for information about wildlife areas within each of their respective districts. Areas to be surveyed were then selected from previously outlined criteria which included total size and amount of wetland habitat.

For each area, field locations and approximate flood contours (natural and managed) were plotted on aerial photographs. Acreage information for fields was provided by area managers. Crop type and yield was available for each field from existing "Crop Production and Distribution Reports" (Appendix A).

A questionnaire, "Area Managers Report" (AMR) was developed to describe general management programs, including farming and water management, on each area (Appendix B). Managers were also asked to identify specific management problems and areas of research that could benefit future management programs.

A second questionnaire, "Individual Field Practices Report", was designed to identify specific management activities and cultural practices used on individual fields (Appendix C). Information about tillage, equipment, use of fertilizers, weed control, seed type, etc., was included to determine the range of cultural practices used on wetland management areas. Area Managers



provided information for fields farmed by area personnel and permittee farmers provided the information for fields farmed under their own permits.

Maps and aerial photo's showing numbered field locations and flood contours were stored for future reference. Information from completed survey forms was entered into microcomputer (dBaseIII) files.

#### Results:

A total of 17 areas were surveyed, representing approximately 96,500 total acres. Water management on the 17 surveyed areas is associated with approximately 28,280 acres. Of those, about 9,230 acres consist of permanent or semi-permanent water, 12,550 acres are under moist-soil management and approximately 6,500 acres are in greentree reservoir management. Two National Wildlife Refuges (Swan Lake and Mingo) were included in the survey due to their size and importance to wintering waterfowl. Management programs on Swan Lake NWR include both state and federal personnel due to a portion of Swan Lake (2500 acres) being licensed to MDC for management and for operation of a public hunting program. The remaining 15 areas, managed exclusively by MDC, represent 64,162 acres. Farming occurs on slightly more than 18,000 acres of fields, although all fields are not necessarily farmed each year.

#### Farming Programs

An indication of the types of crops produced on the surveyed areas is shown in Tables 1 & 2. Most common crop types were soybeans, corn, wheat and milo. Soybeans and corn were the number 1 and 2 crops, respectively, both years. Wheat was third in acreage during 1985 followed by milo and in 1986 the order was reversed. Crop types making up the "other" category include Japanese millet clover, sunflower, millet, bluegrass, rice and oats. The

combined acreage in the "other" category was less than any of the first four categories mentioned.

The number of acres in soybeans is not necessarily a reflection of their importance to waterfowl. Soybeans are an important cash crop for permittee farmers and are usually harvested in lieu of corn or milo. Soybeans are also used in rotation systems as a source of nitrogen and to improve soil tilth. Corn is the number one grain crop that is left standing in fields for wildlife.

#### Crop Rotations

Most areas use some type of crop rotation in their farming operations. Corn was used in all rotations except for two areas in southeast Missouri. Soybeans were utilized in 11 of 17 rotations and wheat was listed in 7. Clover, milo, rice, "annual grasses", and grain are also listed. Specific rotations, by year, are shown in Table 4.

#### Fertilization

All of the areas surveyed use fertilizers to some degree (Table 5). Most areas also utilize soil testing to determine fertilization needs. Soil is tested periodically rather than annually. Only three areas conducted no soil tests during 1985 and 1986.

#### Water Management

Most areas (10 of 18 sources) use river water as a source for reflooding moist soil units and greentree reservoirs. Four areas use ground water from wells and only one area has a storage reservoir as a source of water for flooding dewatered units. Some areas use more than one water source. Areas that use river water may use gravity flow during high river stages or they may pump water during normal river flows. Seven areas utilize portable "crusiffuli" pumps and four use electric pumps. Three areas use permanently

mounted diesel pumps and only one area can manage water levels exclusively by gravity flow. One LP gas pump is also in operation.

Most management areas identified problems associated with their water management system. The most common water management problem listed was (8 of 12 responses) "unplanned natural flooding". Other common problems (7 of 12 responses) were controlling speed of dewatering, reflooding and water depth. Siltation, pin oak or timber regeneration and inability to completely dry out pools for vegetation control were each listed 5 times. Pin oak mortality and erosion were listed twice each as problems with water management.

#### Vegetation Control

Several plant species were identified as undesirable and difficult to control. Cocklebur and willow were far and away the two most undesirable species according to wetland managers.

Control of cocklebur was most difficult when managers could not regulate the speed or timing of dewatering and reflooding. This occurs frequently when the water source is unpredictable or inconvenient such as when relying on high river stages for reflooding or when portable pumps are required to reflood a dewatered area.

Willow control was a problem particularly when the speed and timing of drawdown was uncontrolled. The inability to regulate water depths and to control reflooding also resulted in problems associated with willow invasion. Other problem woody species include cottonwood and buttonbush. Cottonwood can be controlled by varying water depths and buttonbush occurs in low, wet areas that are subject to natural flooding.

Purple loosestrife was not listed as a problem on any of the areas surveyed.



### Research Needs

Sixteen managers responded to questions about types of research that would benefit their management program (Table 6). Nutrient content of waterfowl foods, impacts of agricultural chemicals, nutrient requirements of waterfowl, evaluation of farming techniques and control of problem vegetation were areas most needing additional research according to the area managers. Evaluating crop rotations, including crop types, conventional vs. biological farming, no till farming and producing goose browse were also deemed important.

### Discussion:

Results of the survey identify a range of farming and wetland management activities that occur on wetland management areas. The lack of readily available information about some aspects of farming and wetland programs indicates a need for more formal and standardized record keeping of routine management operations. The specific farming methods of permittee farmers were particularly unavailable. Records of crop type, acreage and yield by permittee farmers will be more available in the future, however, because these records are now being entered into microcomputer files on a routine basis.

The information appearing in this report summarizes current farming and management systems on wetland wildlife areas in Missouri. Also important is the perception of managers as to needed areas of research and a description of specific management problems. The primary value of this survey will be to document existing information and unwritten thoughts and ideas of land management personnel. The information appearing in this report will serve as a basis for discussions about area management programs and will be considered as new research is designed.

Data and Reports:

Original data and related reports in this investigation are on file in the Federal Aid Office of the Missouri Department of Conservation, Columbia, MO 65201.

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Table 1. Total size, field acres and area under water management of 17 wetland wildlife areas, including two national wildlife refuges.

Record Number	Area	Total Acres	Field Acres	Water Acres	Moist Soil	Greentree	Refuge
1	Swan Lake NWR	10,672	1,950	3,050	2,640	0	8,172
2	Mingo NWR	21,675	804	100	2,200	2,600	19,675
3	Upper Miss. Riv.	12,500	963	350	250	0	300
4	Schell-Osage	8,635	1,710	951	1,688	430	1,672
5	Ted Shanks	3,957	1,375	543	290	1,980	3,700
6	Ftn. Grove	6,300	1,652	30	2,100	150	1,250
7	Duck Creek	6,045	803	1,800	618	1,156	1,800
8	Four Rivers	4,460	2,940	95	60	0	560
9	Grand Pass	4,711	3,661	175	0	0	1,490
10	Montrose	1,600	267	1,510	20	0	800
11	Coon Island	3,138	805	206	400	0	0
12	Ten Mile Pond	2,227	1,763	35	980	0	555
13	Franklin Island	1,530	815	0	0	0	500
14	Seven Island	1,360	367	75	80	0	0
15	Otter Slough	1,345	445	250	430	180	555
16	Marais Temps Clair	920	150	10	650	0	300
17	B.K. Leach	690	425	50	150	0	300
TOTAL		91,765	20,895	9,230	12,556	6,496	41,629



Table 2. 1985 Crop Acreage on 16 Wetland Wildlife Areas in Missouri.

Area	Total Crop Acres	Corn	Soybeans	Milo	Wheat	Other
Duck Creek	259	53	2	17	54	133
Fountain Grove	1,033	460	473	100	-	-
Grand Pass	3,300	1,390	1,149	-	30	731
Upper Miss. River	525	139	381	-	-	5
Swan Lake (state)	577	90	0	98	250	139
Schell-Osage	3,257	780	1,310	404	638	125
Franklin Island	774	520	234	20	-	-
Mingo NWR	1,060	243	311	148	272	86
Ted Shanks	1,325	698	558	39	-	30
Marais Temps Clair	62	37	25	-	-	-
Ten Mile Pond	1,763	145	889	729	-	-
Seven Island	465	-	180	185	100	-
Otter Slough	401	20	106	47	-	228
Montrose	299	112	116	71	-	-
Four Rivers	1,695	117	839	479	260	-
Coon Island	135	-	30	25	-	80
TOTAL	16,930	4,804	6,603	2,362	1,604	1,557

Table 3. 1986 Crop Acreage on 16 wetland wildlife areas in Missouri.

Area	Total Crop Acres	Corn	Soybeans	Milo	Wheat	Other
Duck Creek	347	110	-	20	77	140
Fountain Grove	893	451	357	40	-	45
Grand Pass	2,570	984	1,415	-	65	106
Upper Miss. River	460	198	198	15	-	49
Swan Lake (state)	802	29	-	-	773	-
Schell-Osage	1,015	223	373	184	204	31
Franklin Island	646	604	42	-	-	-
Mingo NWR	804	-	-	-	-	-
Ted Shanks	1,372	501	715	59	77	20
Marais Temps Clair	64	33	-	-	22	9
Ten Mile Pond	1,238	433	580	155	-	70
Seven Island	475	175	186	-	114	-
Otter Slough	378	72	61	74	-	171
Montrose	218	49	89	76	-	4
Four Rivers	1,789	373	983	433	-	-
Coon Island	560	-	205	205	-	150
TOTAL	13,631	4,235	5,204	1,261	1,332	795

Table 4. Standard rotation systems given for responding areas.

Area	Year One	Year Two	Year Three	Year Four	Year Five	Land Type
Upper Miss. R.	Corn	Soybeans	Corn	Soybeans	Corn	All
Swan Lake	Corn Wheat	Wheat Wild food	Clover Corn	Corn Wheat	Wheat Wild food	Not flooded Flooded
Schell-Osage	Corn Corn	Wheat Soybeans	Legume Wheat	Corn Corn	Wheat Soybeans	MDC Permittee
Fountain Grove	Corn	Soybeans	Wheat	Sweet clover	Corn	All
Grand Pass	Corn	Browse	Wheat	Clover	Corn	All
Ted Shanks	Corn	Soybeans	Corn	Soybeans	Corn	All
Marais Temps Clair	Soybeans Wheat	Clover	Clover	Corn	Soybeans Wheat	All
Duck Creek	Grain	An. Grass	Grain	An. Grass	Grain	All
Ten Mile Pond	Corn/milo	Soybeans	Corn/milo	Soybeans	Corn/milo	All
Seven Island	Corn	Soybeans	Corn	Soybeans	Corn	All
Otter Slough	Rice	Rice	Soybeans	Milo	Rice	All
Gayoso Bend	Milo	Soybeans	Milo	Soybeans	Milo	All
Montrose	Corn Corn	Clover Soybeans	Milo Milo	Clover Soybeans	Corn Corn	MDC uplands MDC (permittee bottomlands)
Four Rivers	Corn	Soybeans	Milo	Soybeans	Corn	All



Table 5. Number of fields in each area having fertilizer applied and soil tests made, 1985 & 1986.

Area	Year	Total Area Fields	Number of Fields With Fertilizer Applied	Number of Fields w/Soil Test After 1984 & Fertilizer Applied
Schell-Osage	1985	109	26	14
	1986		24	6
Fountain Grove	1985	102	25	12
	1986		24	--
Grand Pass	1985	91	5	0
	1986		0	1
Swan Lake	1985	36	11	11
	1986		4	4
Ted Shanks	1985	41	10	2
	1986		5	1
Ten Mile Pond	1985	18	--	--
	1986		7	6
Otter Slough	1985	16	9	9
	1986		9	9
Upper Miss. R.	1985	16	1	0
	1986		2	0
Marais Temps Clair	1985	23	3	0
	1986		3	0
Duck Creek	1985	55	16	0
Montrose	1985	43	12	5
	1986		10	9
Four Rivers	1985	75	2	0
	1986		22	6

Table 6. Manager responses on types of research they feel would be helpful to their management.

Research	Number Responding
Nutrient content of moist soil and agricultural foods	9
Impacts on wildlife of herbicides	9
Nutrition requirements of waterfowl	9
Evaluating farming techniques for wildlife/waterfowl	9
Evaluating crop rotations	7
a. evaluating crop types	
b. non-chemical vs. conventional farming	
c. no-till farming	
d. forage production for goose browse	
Control of problem vegetation	9
Water management: best drawdown - reflooding - dates	4
Vegetation management	3
Greentree Reservoir management	2
Production of nitrogen for row crops	1
Public use vs. management	1
Control of seedling depredation	1
TOTAL AREAS REPORTING	16



## CROP PRODUCTION AND DISTRIBUTION REPORT

Division: <u>Wildlife/Grand River District</u>	Permittee: <u>Department Planted</u>	Prepared by: <u>Rob Leonard</u> <i>(signature)</i>
Area or Unit: <u>Fountain Grove Wildlife Area</u>	Crop Year: <u>1985</u>	Date Prepared: <u>1/30/86</u>

	Field Number(s) (1)	Total Acres (2)	Crop (3)	Commission Share Acres (4)	Disposition of Commission Share						
					Acres Left in Field (5)	Acres Harvested (Commission Share) (6)	Quantity Harvested (bu., lb., etc.) (7)	Yield Per Harvested Acre (8)	Disposition of Commissions Harvested Share		
									Stored or Transferred (bu., lbs., etc.) (9)	Sold	
									Quantity (10)	Money Transmitted (11)	Unit Price (Average) (12)
1	Pool 1, 2, 3, K-6, E7	197	Corn	193.17	193.17	3.83	462.84	121	462.84 <sup>(1)</sup>		
2											
3	K-6	18.6	Beans	18.6	18.6	0 (2)	0	0			
4											
5	Pool 1, 2, 3, MacIn.	68	Milo	68	68	0 (3)					
6											
7	Pool 1, 2, 3, MacIn.	163	Jap. Millet	163	163	0 (4)					
8	West Parsons										
9	Pool 1, 2, 3, K-6,	377	Wheat	377	377	0 (5)					
10	K-10, K-11, K-8,										
11	K-1-5, MacIn., J-Pool, H-Pool										
12											
13											
14											
15											
16											

Remarks: (1) Stored in Sumner for goose trapping. (2) Plowed down for green manure. (3) Left in field for wildlife yield est. ranged from 30 - 60 bu/a. (4) Estimated yield 1,000 lbs/a. (5) 300 acres aerial seeded into permittee beans for browse and green manure - 77 acres drilled for browse.





Missouri Department of Conservation  
Area Managers Report

APPENDIX B

Area _____		Name _____		Code _____		Total Acres _____		Acres Crop _____		Acres _____									
								Fields _____		Permanant _____									
Manager _____		Name _____		Code _____		Acres _____		Refuge _____		Crop _____									
						Managed _____		Acres _____		Year _____									
						Marsh _____													
1	2	3	4	5	6	7	8												
Managed Flood Method Code	Water Management Problem Code	Plants Difficult To Control Code	Source of Water For Managed Flooding (Code)	Drawdown (begin) Month	Drawdown (complete) Month	Managed Reflood (complete) month	Number of Permittee Farmers												
9		10				11		12											
Total Acres (by crop) Produced on Area		Bushels (lbs., etc.) Left in Field (by crop type) For				Five Year Standard Rotation System		Types of Research that Would Benefit Your Management Program (Codes)											
1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8				
1. If natural, unplanned flooding is a problem, how often (%) does flooding change planting plans? (Explain)																			
2. What Chemicals (herbicides, insecticides) did you use in this year? (ie, herbicide-atrazine-post/emergent-qts/A)																			
3. Describe the MDC farm equipment that was used during this year. (tractors, disks, other)																			
(continues on back)																			
Managers Signature: _____ Date: _____																			

## APPENDIX C

[illegible]

PERMISSION TO QUOTE

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